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September 15, 2015

Docket Control
Arizona Corporation Commission
1200 W. Washington Street
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ORIGINAL

RE: Arizona Public Service Company 2016 Renewable Energy Standard Implementation Plan: Report on Large-Scale DG
Docket No. E-01345A-15-0241.

Attached please find Arizona Public Service Company's Addendum to its 2016 Renewable Energy Standard Implementation Plan. The Addendum is a report on the feasibility, cost and benefits of large-scale distributed generation as required in Decision No. 74949 (February 9, 2015).

If you have any questions regarding this information, please contact me at (602) 250-3341.

Sincerely,

Kerri C

Kerri A. Carnes

KC/kr

cc: Parties of Record
Eric Van Epps

Arizona Corporation Commission
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SEP 15 2015

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Copies of the foregoing delivered/mailed this 15th day of September, 2015, to:

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2016 Renewable Energy Standard Implementation Plan Addendum: Report on Large-Scale Distributed Generation

Arizona Public Service Company (APS or Company) filed its 2016 Renewable Energy Standard Implementation Plan (2016 Plan) on July 1, 2015. In the Arizona Corporation Commission (Commission) Order approving APS's 2015 Renewable Energy Standard Implementation Plan, APS was ordered to file a report on the feasibility, cost, benefits and other aspects of larger scale (at least 1 MW) utility-owned distributed generation facilities located within a utility's grid.[1] For this Report, APS has defined large-scale DG as 1-5 MW single-axis tracking solar facilities located on the sub-transmission system in close proximity to a load pocket.

A. Feasibility

APS has more than 50 years of development and operational experience with large and small-scale utility-owned power plants and distributed energy facilities, and has incorporated renewable energy development into its core business. APS's system currently has a total of 904 MWac of solar installed on its system; 202 MWac is APS owned, 310 MWac is solar PPAs, and 392 MWac is third-party owned DG. APS has the capability to incorporate large-scale utility owned DG on its system with locations in close proximity to, or in, the load pocket and connected to a sub-transmission line (69kV or less). For example, all of the projects under APS's AZ Sun program[2] connect to the system through sub-transmission lines.

B. Cost

Large-scale DG with locations in close proximity to, or in, the load pocket and connected to a sub-transmission line provides solar energy at a lower cost than aggregate small-scale DG. Table 1 demonstrates that large-scale DG costs are less expensive than a comparable amount of capacity from aggregated distributed rooftop systems. The key parameters for assessing these cost trends are discussed below.

Table 1

	Large-Scale DG[a]	Small-Scale DG[b]
Capacity (MW_{ac})	5	5
Capacity Factor (%)	32%	22.10%
Installed Cost ($\$/Watt_{ac}$)	\$2.25 - 2.75[c]	\$3.24 - 3.82
\$/kWh	\$0.068 - 0.081	\$0.135 - 0.156

a. Defined in Table 1 as 5MWac of continguously sited single axis tracking panels.
b. Defined in Table 1 as 5MW of aggregate fixed position panels or approximately 700 aggregated rooftop solar systems.
c. Land acquisition costs included in installed cost calculation.

[1] Decision No. 74949 (February 9, 2015).
[2] AZ Sun program is a Commission approved program that authorized APS to engage third-party developers to build over 200MW of solar for APS.

Table 1 shows the significant differences between large-scale DG and distributed rooftop systems (small-scale systems) on the parameters most important for realized energy costs, capacity factor, and installed costs. Because the cost trajectory for solar systems has been declining rapidly in recent years, this report shows results for a range of installed costs.[3] The other key difference between large-scale and small-scale systems can be seen in the capacity factor assumptions. The capacity factors used in this analysis are based on APS's observed experience with AZ Sun plants, plants under long-term purchase agreements, and distributed rooftop systems installed on customers' premises in APS's service territory. Otherwise, APS would expect little to no difference in the remaining elements influencing the overall costs of the two different types of projects. Both types of projects are assumed to qualify for the 30% investment tax credit (ITC)[4] if completed by the end of 2016 and that the state production tax credit will be unavailable for new projects in the near term. Finally, system lives, tax rates and operating and maintenance costs[5] should be comparable across the systems. In addition to the information provided above, there are a number of other studies reaching the same or similar conclusions on the cost savings of large-scale over small-scale DG and residential roof-top solar.[6]

C. Benefits

There are numerous benefits from large-scale DG with locations in close proximity to, or in, the load pocket and connecting to the sub-transmission system. These benefits include, but are not limited to:

- cost savings for all customers;
- utilization of economies of scale;
- increased reliability over third-party owned facilities;
- less risk for all customers; decreasing customer risk involved in third-party finance mechanisms (such as legal, financial and property encumbrances);
- improved technical communications; and
- advanced inverter capability for system services.

[3] Recent AZ Sun project bids and data from arizonagoessolar.org were used in determining these values.
[4] The analysis on Table 1 assumes that all solar project owners will receive a federal ITC based on the installed costs. Solar market and financial analysts report, however, that under the third-party ownership (TPO) business model, some developers (including solar leasing companies) claim an ITC on an appraised "fair market value" of the solar system rather than on installed costs. As reported by Lawrence Berkeley National Laboratory, the appraised FMV can be significantly higher than the installed costs. Bolinger, M., & Holt, E. (2015). A Survey of State and Local PV Program Response to Financial Innovation and Disparate Federal Tax Treatment in the Residential PV Sector. - Report Number: LBNL-181290. https://publications.lbl.gov/islandora/object/ir%3A181290
[5] O&M expenses from APS's AZ Sun and Schools & Governments projects were used in determining these values.
[6] The Brattle Group: Tsuchida, B., Sergici, S., Mudge, B., Gorman, B., Fox-Penner, P., & Schoene, J. (July 215). Comparative Generation Costs of Utility-Scale and Residential-Scale PV in Xcel Energy Colorado's Service Area. http://www.brattle.com/system/publications/pdfs/000/005/188/original/Comparative_Generation_Costs_of_Utility-Scale_and_Residential-Scale_PV_in_Xcel_Energy_Colorado's_Service_Area.pdf?1436797265; and
Brown, A. & Bunyan, J. (December 2014). Valuation of Distributed Solar: A Qualitative View.
http://hks.harvard.edu/hepg/Papers/2014/12.14/Brown%20%20Valuation%20of%20%20Distributed%20Solar%20%2011.14.pdf

APS recently started offering its Solar Partner Program,[7] which provides the first opportunity for many customers to participate in a solar program, as well as providing the company the ability to achieve greater system reliability coupled with choice and flexibility for customers. In the future, large-scale DG facilities and programs can offer even more solar options to APS customers, including renters, multi-family units and other customers. While the benefits of these programs are clear, APS has not proposed a large-scale DG program in its 2016 Plan, but will continue to evaluate the potential of large-scale DG and re-assess additional solar program offerings in the future.

[7] APS is in the process of installing approximately 10MW of residential roof-top solar resources on 1,500 customer roofs. The research program is designed to not only generate solar energy, but to allow APS to study and gain a greater understanding of the effects of roof-top solar on individual distribution lines, the impact of high solar penetration on distribution lines and the capabilities and integration of advanced inverter controls.